

**UTILITY PATENT APPLICATION TRANSMITTAL LETTER**

(Only for new nonprovisional applications under 37 CFR 1.53(b))

Docket No.  
NE-1024-US/KM**To the Assistant Commissioner for Patents:**

Transmitted herewith for filing is the patent application of:

Tetsuji ADACHI

corresponding to Japanese application No. 11-255390, filed  
September 9, 1999,entitled: METHOD OF UPDATING CLIENT'S INSTALLED DATA IN RESPONSE  
TO A USER-TRIGGERED EVENT

## Enclosed are:

- |                                     |   |
|-------------------------------------|---|
| <input checked="" type="checkbox"/> | 18 pages of specification.  |
| <input checked="" type="checkbox"/> | 12 sheets of formal drawings.   |
| <input checked="" type="checkbox"/> | a newly-executed declaration of the inventor.   |
| <input type="checkbox"/>            | a copy of an executed declaration of the inventor from prior application<br>Serial No. , filed .  |
| <input type="checkbox"/>            | incorporation by reference. The entire disclosure of the prior application,<br>from which a copy of the oath or declaration is supplied as indicated in the<br>preceding box, is considered as being part of the disclosure of the accom-<br>panying application and is hereby incorporated by reference therein. |
| <input checked="" type="checkbox"/> | an assignment of the invention to NEC Corporation, including assignment<br>cover sheet.   |
| <input type="checkbox"/>            | Information Disclosure Statement with Form PTO-1449.  |
| <input type="checkbox"/>            | copies of the Information Disclosure Statement citations.   |
| <input checked="" type="checkbox"/> | preliminary amendment.  |
| <input checked="" type="checkbox"/> | return receipt postcard (MPEP 503), specifically itemized.  |
| <input type="checkbox"/>            | a verified statement to establish small entity status under 37 CFR 1.9 and 1.27.  |
| <input type="checkbox"/>            | a verified statement to establish small entity status filed in prior application.<br>Status is still proper and desired.  |
| <input type="checkbox"/>            | a certified copy of the Priority Document.  |
| <input checked="" type="checkbox"/> | other: Data Entry Sheet .   |

If a CONTINUING APPLICATION, check appropriate box and supply the requisite informa-  
tion.☐ Continuation ☐ Divisional ☐ Continuation-in-part (CIP)

of prior application No. , filed .

- |                                     |   |
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**UTILITY PATENT APPLICATION TRANSMITTAL LETTER**  
(continued)

Docket No.  
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**CLAIMS AS FILED**

	NO. FILED	NO. EXTRA	RATE	FEE
BASIC FEE			\$ 690	\$ 690
TOTAL CLAIMS	30 - 20 =	10	X\$ 18	180
INDEPENDENT CLAIMS	12 - 3 =	9	X\$ 78	702
MULTIPLE DEPENDENT CLAIM PRESENT			\$ 260	

**TOTAL** \$1572

If applicant has small entity status under 37 CFR 1.9 and 1.27, then divide total fee by 2, and enter amount here.

**SMALL ENTITY TOTAL**

\$

X

A check in the amount of \$1612 to cover the filing fee is enclosed.

X

The Commissioner is hereby authorized to charge indicated fees and credit any over-payments to Deposit Account No. 25-0120 in the name of Young & Thompson, as described below. A duplicate copy of this sheet is enclosed.

Charge the amount of \$ as filing fee.

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Credit any overpayment.

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Charge any additional fee required under 37 CFR 1.16 and 1.17, during the pendency of this application.

Charge the issue fee set in 37 CFR 1.18 at the mailing of the Notice of Allowance.

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September 7, 2000

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APPLICATION INFORMATION

Title Line One:: METHOD OF UPDATING CLIENT'S INSTALLED  
Title Line Two:: DATA IN RESPONSE TO A USER-TRIGGERED  
Title Line Three:: EVENT  
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PRIOR FOREIGN APPLICATION

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Filing Date:: SEPTEMBER 9, 1999  
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Priority Claimed:: Yes

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of

Tetsuji ADACHI

Box Non-fee Amendment

Serial No. (unknown)

GROUP

Filed herewith

Examiner

METHOD OF UPDATING CLIENT'S  
INSTALLED DATA IN RESPONSE  
TO A USER-TRIGGERED EVENT

PRELIMINARY AMENDMENT

Commissioner for Patents

Washington, D.C. 20231

Sir:

Prior to the first Official Action and calculation of the filing fee, please amend the above-identified application as follows:

IN THE CLAIMS:

Claim 5, line 1, cancel "2, 3 or 4".

Claim 6, line 1, cancel "2, 3 or 4".

Claim 8, line 1, cancel "or 3".

Claim 9, line 1, cancel "or 4".

Claim 12, line 1, cancel "or 11".

Claim 13, line 1, cancel "or 11".

Claim 14, line 1, cancel "or 11".

Claim 21, line 1, cancel "18, 19 or 20,".

Claim 22, line 1, cancel "18, 19 or 20,".

Claim 24, line 1, cancel "18, 19 or 20,".

Tetsuji ADACHI

Claim 27, line 1, cancel "or 26".

Claim 28, line 1, cancel "or 26".

Claim 29, line 1, cancel "or 26".

Claim 30, line 1, cancel "or 26".

Respectfully submitted,

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By



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TITLE OF THE INVENTION

**Method of Updating Client's Installed Data in Response to  
a User-Triggered Event**

BACKGROUND OF THE INVENTIONField of the Invention

The present invention relates to a method of updating data such as control programs, files and data modules.

Description of the Related Art

Recent advances in mobile communications and integrated circuit technologies have made possible the proliferation of low-cost, small mobile (client) terminals that are easy to communicate with an increasing number of communication terminals and systems through the mobile communication network or the Internet. An increasing number of software packages (such control programs, associated file data, and data modules) have been developed for installation on mobile terminals in order to meet new customer services. However, whenever users desire a new service feature, the assistance of trained personnel is required to update their software packages.

Transmission of software data can be done in one of two known methods. In the first method, called "pull technologies", users take the initiative for retrieving data from sources such as World Wide Web. The second method, called "push technologies", is one that is initiated by news servers on the internet which take the initiative to distribute news to users on a broadcast mode. These known methods may be used for updating software installed on user terminals.

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1           However, the pull technologies inherently require the initiative  
2 on the client side, while the updating of software itself must be initiated  
3 from the source where the software was created or modified. The push  
4 technologies, on the other hand, require that file transfer be performed  
5 on a broadcast mode. However, the burden of the network will increase  
6 significantly if it were to carry traffic to a large number of user  
7 terminals.

8                           SUMMARY OF THE INVENTION

9           It is therefore an object of the present invention to provide an  
10 efficient method of updating data installed on a client (mobile) terminal  
11 when a user-triggered event occurs on the user's terminal.

12           According to a first aspect of the present invention, there is  
13 provided a method of updating data installed on a client terminal from  
14 a server system via a communication network. According to the present  
15 invention, the client terminal, such as mobile terminal, stores a version  
16 number of the installed data and transmits a request message to the  
17 server system via the communication network in response to an event  
18 triggered by a user of the client terminal, the request message containing  
19 the version number of the data and a phone number of the client  
20 terminal. The server system stores most recent data and a version  
21 number of the most recent data. When the server system receives the  
22 transmitted request, it compares the version number contained in the  
23 received request to the stored version number and transmits a copy of  
24 the most recent data and the version number of the most recent data to  
25 the client terminal via the communication network if there is a  
26 mismatch between the compared version numbers. The client terminal

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1 receives the copy of the most recent data and the version number  
2 from the server system and updates the installed data with the received  
3 copy and updates the stored version number with the received version  
4 number.

5 According to a second aspect of the present invention, the client  
6 terminal transmits a request message to a server system via a  
7 communication network in response to an event triggered by a user of  
8 the client terminal, the request message containing a phone number of  
9 the client terminal. The server system stores most recent data and  
10 further stores a version number of the most recent data in a first  
11 memory and maps a plurality of version numbers of the data to a  
12 plurality of phone numbers in a second memory. The server system, on  
13 receiving the request transmitted from the client terminal, compares a  
14 version number mapped in the second memory corresponding to the  
15 phone number contained in the received request to the version number  
16 of the most recent data stored in the first memory. If there is a  
17 mismatch between the compared version numbers, the server system  
18 transmits a copy of the most recent data to the client terminal via the  
19 communication network and updates the corresponding mapped  
20 version number in the second memory with the version number of the  
21 first memory. The client terminal receives the copy of the most recent  
22 data from the server system and updates the installed data with the  
23 received copy.

#### 24 BRIEF DESCRIPTION OF THE DRAWINGS

25 The present invention will be described in further detail with  
26 reference to the accompanying drawings, in which:



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1 Fig. 1 is a block diagram of a mobile communication network  
2 according to the present invention for updating mobile's file data  
3 through a communication network;

4 Fig. 2 is a block diagram of the mobile terminal of Fig. 1;

5 Fig. 3 is a flowchart for operating the mobile terminal according  
6 to a first embodiment of the present invention;

7 Fig. 4 is a block diagram of the home location register of Fig. 1;

8 Fig. 5 is a flowchart for operating the home location register  
9 according to the first embodiment of the present invention;

10 Fig. 6 is a block diagram of the server of Fig. 1;

11 Figs. 7A and 7B are flowcharts for operating the server according  
12 to the first embodiment of the present invention;

13 Fig. 8 is a sequence diagram for illustrating the overall operation  
14 of the system according to the first embodiment of the present  
15 invention;

16 Fig. 9 is a flowchart for operating the mobile terminal according  
17 to a second embodiment of the present invention;

18 Fig. 10 is a block diagram of the home location register according  
19 to the second embodiment of the present invention;

20 Fig. 11 is a flowchart for operating the home location register  
21 according to the second embodiment of the present invention;

22 Fig. 12 is a flowchart for operating the server according to the  
23 second embodiment of the present invention;

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1 Fig. 13 is a sequence diagram for illustrating the overall operation  
2 of the system according to the second embodiment of the present  
3 invention;

4 Fig. 14 is a flowchart for operating the server for controlling the  
5 network traffic when the network is likely to be overloaded with  
6 updating file transfer; and

7 Fig. 15 is a flowchart for operating the home location register for  
8 controlling the network traffic when the network is likely to be  
9 overloaded with updating file transfer.

#### 10 DETAILED DESCRIPTION

11 Referring now to Fig. 1, there is shown a mobile communication  
12 system according to the present invention as one example of client-  
13 server systems. The system includes a mobile communications network  
14 11, a home location register 12, a server 13 and a network manager 14.  
15 Mobile communication network 11 is made up of a large number of  
16 wireless base stations each providing a coverage of a cell to serve a  
17 mobile terminal 10. When the mobile terminal 10 enters one of the cells  
18 or remains in one cell, a location registration request is sent from the  
19 mobile terminal to the network. Home location register 12 is connected  
20 to the network to receive the location registration request and provides  
21 mapping of the mobile's address number to the address number of the  
22 current base station.

23 As shown in Fig. 2, the mobile terminal includes a memory 20  
24 such as flash memory or a random-access memory for storage of a  
25 control program, associated files and software version numbers. A

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1 control unit (CPU) 21 is connected to the memory 20 to perform signal  
2 processing according to the control program of the memory 20. Mobile  
3 terminal 10 is connected to a transceiver 22 to transmit and receive  
4 control signals to and from the network via a wireless interface 23. A  
5 speech circuit 24 is connected to the transceiver 22 and further to the  
6 mobile terminal 10 to establish and maintain speech communication. A  
7 keypad 25 and a display unit 26 are also connected to the mobile  
8 terminal 10. Mobile terminal 10 has the functions of sending a location  
9 registration request at the time the mobile terminal is powered on or a  
10 call is initiated or terminated.

11 The operation of the mobile terminal 10 proceeds according to the  
12 flowchart of Fig. 3.

13 When the mobile terminal is briefly in a state that occurs in  
14 response to the power switch being turned on, a call-origination or a  
15 call-termination key is operated on the keypad (block 101), the mobile  
16 terminal 10 reads the version number of a specified file from the  
17 memory 20 (block 102). Mobile terminal 10 transmits a location  
18 registration request containing the retrieved version number and the  
19 mobile's phone number to the network via the base station of the local  
20 cell (block 103).

21 Mobile terminal 10 now enters a waiting state for a response from  
22 the network. As will be described, the transmitted signal is passed  
23 through the mobile communication network 11 to the home location  
24 register 12 where the version number of the specified file is compared to  
25 its most recent version number. If they mismatch, the home location

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1 register 12 sends a download request to the server 13, which begins a file  
2 transfer to download the file data of the most recent version to the  
3 mobile terminal 10 through the network 11.

4 When the mobile terminal starts receiving the transmitted file  
5 data (block 104), the mobile terminal 10 proceeds to block 105 to store  
6 the received data in a new memory space reserved in the memory 20  
7 and performs an error check on the received file data (block 106). If no  
8 error is detected (block 107), the mobile terminal 10 moves the read  
9 pointer to the new memory space and deletes the old file from the  
10 memory 20 (block 108) and returns a positive acknowledgment message  
11 to the server 13 via the network 11 (block 110). If an error is detected  
12 (block 107), flow proceeds to block 110 to delete the new file data and  
13 sends back a negative acknowledgment message to the server 13 (block  
14 111) and returns to decision block 104 for receiving a retransmitted file.  
15 and repeating an error check process on the retransmitted file data.

16 As shown in Fig. 4, the home location register 12 is connected to  
17 the server 13 via a line receiver 30 and a line transmitter 31 and  
18 connected to the network 11 via a line receiver 32 and a line transmitter  
19 33. A controller 34 is connected to the line receiver 30 to receive a new  
20 version number of the specified file from the server 13 and updates the  
21 old version number of the specified file stored in a most recent version  
22 number memory 35 with the received file number and then returns an  
23 acknowledgment message to the server 13 via the line transmitter 31.  
24 Controller 34 is also connected to the line receiver 32 to receive location  
25 registration requests and accompanying version numbers of specified

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1 files from the network 11. In response to a location registration request  
2 from the network, the home location register 12 compares the version  
3 number of a file contained in the request with the most recent version of  
4 the file stored in the memory 35 to determine if they match or mismatch.  
5 If they mismatch, the home location register 12 sends a download  
6 request to the server 13.

7 Fig. 5 is the flowchart of the operation of the home location  
8 register 12. Home location register 12 monitors the outputs of the line  
9 receivers 30 and 32 to check to see if a new file number is received from  
10 the server 13 (block 201) or a location registration request is received  
11 from the network (block 204). When the home location register 12  
12 receives a new version number of a specified file from the server 13, the  
13 home location register 12 proceeds from block 201 to block 202 to  
14 update the old version number of the specified file stored in the memory  
15 35 with the received new version number and returns an  
16 acknowledgment message to the server 13 (block 203). When the home  
17 location register 12 receives a location registration request from the  
18 network 11, its controller proceeds from block 204 to block 205 to  
19 compare the version number of a file contained in the location  
20 registration request to the most recent version number of the file stored  
21 in the memory 35. If they match (block 206), the routine is terminated.  
22 If they mismatch, the home location register 12 determines that the  
23 version number of the requesting mobile terminal is older than its most  
24 recent version number, and proceeds from block 206 to block 207 to send  
25 a download request to the server 13 via the line transmitter 31. This

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1 download request contains the telephone number of the requesting  
2 mobile terminal.

3 In Fig. 6, the server 13 includes a controller 45 which is connected  
4 to the home location register 12 via a line receiver 40 and a line  
5 transmitter 41 and further connected to the network 11 via a line  
6 receiver 42 and a line transmitter 43. Additionally, a line receiver 44 is  
7 provided to interface the controller 45 to the network manager 14. A  
8 memory 46 holds the most recent program for operating mobile  
9 terminals, associated files and file version numbers. Controller 45  
10 updates the contents of the memory 45 with data downloaded from the  
11 network manager 14.

12 According to the flowchart shown in Fig. 7A, a file update routine  
13 of the server 13 starts with block 301 where the server 13 checks to see if  
14 any of the stored files in the memory 46 has been updated with a new  
15 file downloaded from the network manager 14. If this is the case, the  
16 server 13 reads the version number of the updated file from the memory  
17 45 and sends it to the home location register 12 (block 302) and waits for  
18 an acknowledgment message from the home location register. If an  
19 acknowledgment message is not received within a specified period of  
20 time from the home location register (block 303), the server 13 returns to  
21 block 302 to retransmit the version number of the new file. If an  
22 acknowledgment message is received within the specified time period  
23 (block 303), the server terminates the routine.

24 In Fig. 7B, the server 13 begins a download routine in response to  
25 a download request message sent from the home location register 12

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1 (block 310) by reading the mobile's telephone number contained in the  
2 received message (block 311). Server 13 begins a file transfer in block  
3 312 by transmitting the updated most recent file data to the requesting  
4 mobile terminal via the communications network 11. When the file  
5 transfer is completed, the server 13 waits for a positive or a negative  
6 acknowledgment message from the mobile terminal (block 313). If a  
7 negative acknowledgment message is received, the server 13 returns to  
8 block 312 to repeat the file transfer until it receives a positive  
9 acknowledgment message from the mobile terminal.

10 For a full understanding of the present invention, the overall  
11 operation of the client-server system of the first embodiment is shown in  
12 the sequence diagram of Fig. 8.

13 Network manager 14 provides overall control of the client-server  
14 system by making improvements to files used in the client terminals at  
15 intervals. When improvements have been made of a given file and the  
16 version number of the file is updated, the new file data and the new  
17 version number are transmitted from the network manager 14 to the  
18 server 13 to update the old file data and its version number (see also  
19 block 301, Fig. 7A). The new version number is then transmitted from  
20 the server 13 to the home location register 12 (block 302, Fig. 7A). If the  
21 transmitted new version number is successfully received (block 201, Fig.  
22 5), the home location register 12 updates the old version number of the  
23 file stored in the version number memory 35 with the received number  
24 (block 202) and returns an acknowledgment message to the server 13  
25 (block 203).

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1           When a mobile terminal 10 sends a location registration request  
2   containing the version number of the given file to the network 11 and  
3   the home location register 12 receives it through the network 11 (block  
4   204, Fig. 5), the home location register compares the version number  
5   contained in the request to the most recent version number of the file  
6   stored in the version number memory 35 (block 205). If the version  
7   number contained in the location registration request differs from the  
8   most recent number (block 206), the home location register sends a  
9   download request containing the phone number of the mobile terminal  
10   to the server 13 (block 207). In response to the download request, the  
11   server 13 sends the file data of the most recent version to the mobile  
12   terminal 10 through the network 11 (blocks 310 to 313, Fig. 7B). Mobile  
13   terminal 10 updates its old file with the new file sent from the server 13  
14   if no error is detected in the received file, and returns a positive  
15   acknowledgment to the server 13 via the network 11.

16           The present invention allows efficient updating of user's installed  
17   data by sending a single location registration request to the network  
18   whenever the user triggers an event on the mobile terminal such as  
19   power-on state, or an operating state of a start-of-call key and an end-  
20   of-call key, even though the user is not intended to do so. The traffic  
21   load on the communication network is thus reliably and evenly  
22   distributed among mobile terminals.

23           In a second embodiment of the present invention, the mobile  
24   terminal, the home location register and the server of the present  
25   invention may be modified as shown in Figs. 9, 10, 11 and 12. As shown



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1 in Fig. 10, the home location register 12 of this modification additionally  
2 includes a memory 36 in which a plurality of version numbers of a file  
3 are mapped to a plurality of mobile's phone numbers, instead of storing  
4 the version number of the file in the memory 20 of mobile terminal. In  
5 addition, the server 13 operates according to the flowchart of Fig. 7A as  
6 in the previous embodiment when a new file is sent from the network  
7 manager 14. The second embodiment relieves the burden of each mobile  
8 terminal from maintaining the version numbers of installed data by  
9 shifting the burden to the home location register 12.

10 Specifically, the mobile terminal 10 operates according to the  
11 flowchart of Fig. 9 in which block 400 is used to replace blocks 102 and  
12 103 (Fig. 3) of the previous embodiment. Since no file version numbers  
13 are stored in the mobile terminal, the location registration request is  
14 simply sent to the network with no further information as indicated in  
15 block 400.

16 Home location register 12 operates according to the flowchart of  
17 Fig. 11. Home location register 12 operates in the same way as in the  
18 previous embodiment until it receives a location registration request  
19 from the mobile terminal (block 204). In response to the location  
20 registration request, the home location register 12 compares the file  
21 version number of the requesting mobile terminal stored in a location of  
22 the memory 36 identified by the mobile's phone number to the most  
23 recent file version number stored in the memory 35 (block 500). If they  
24 mismatch (block 501), a download request is sent from the home  
25 location register to the server 13, containing the mobile's phone number

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1 (block 502).

2 In Fig. 12, the server 13 performs a file transfer in the same way as  
3 in the flowchart of Fig. 7B in response to the download request from the  
4 home location register (blocks 310 to 312) and waits for a positive  
5 acknowledgment message from the mobile terminal (block 313). When  
6 a positive acknowledgment message is received from the mobile  
7 terminal, the server sends an acknowledgment message to the home  
8 location register (block 600), and terminates the routine.

9 Returning to Fig. 11, the home location register receives an  
10 acknowledgment message from the server (block 503). In response to  
11 this message, the home location register proceeds to update the mobile's  
12 file version number in the memory 36 with the most recent file version  
13 number stored in the memory 35, and terminates the routine.

14 The overall operation of the client-server system of the second  
15 embodiment is shown in the sequence diagram of Fig. 13.

16 Similar to the first embodiment, when improvements have been  
17 made of a given file and the version number of the file is updated, the  
18 new file data and the new version number are transmitted from the  
19 network manager 14 to the server 13 to update the old file data and its  
20 version number (block 301, Fig. 7A). The new version number is then  
21 transmitted from the server 13 to the home location register 12 (block  
22 302). If the transmitted new version number is successfully received  
23 (block 201, Fig. 11), the home location register 12 updates the old version  
24 number of the file stored in the version number memory 35 with the  
25 received number (block 202, Fig. 11) and returns an acknowledgment

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1 message to the server 13 (block 203, Fig. 11).

2 When a mobile terminal 10 sends a location registration request  
3 to the network 11 and the home location register 12 receives it through  
4 the network 11 (block 204, Fig. 11), the home location register compares  
5 the mobile's file version number stored in the memory 36 corresponding  
6 to the mobile's phone number to the most recent version number of the  
7 file stored in the version number memory 35 (block 500, Fig. 11). If the  
8 mobile's version number in memory 36 differs from the most recent  
9 number in memory 35 (block 501), the home location register sends a  
10 download request containing the phone number of the mobile terminal  
11 to the server 13 (block 502). In response to the download request, the  
12 server 13 sends the file data of the most recent version to the mobile  
13 terminal 10 through the network 11 (blocks 310 to 312, Fig. 12). Mobile  
14 terminal 10 updates its old file with the new file sent from the server 13  
15 if no error is detected in the received file, and returns a positive  
16 acknowledgment message to the server 13 via the network 11. When  
17 the server receives this message from the mobile terminal (block 313,  
18 Fig. 12), it sends an acknowledgment message back to the home location  
19 register (block 600, Fig. 12). In response to this acknowledgment  
20 message, the home location register updates the mobile's file version  
21 number in memory 36 with the most recent file version number in  
22 memory 35 (blocks 503, 504, Fig. 11).

23 A further modification of the present invention is shown in Figs.  
24 14 and 15.

25 Controller 45 of the server 13 is programmed to perform the

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1 routine of Fig. 14. In this routine, the server 13 monitors the download  
2 request traffic from the home location register 12 and imposes a  
3 restriction control on the file transfer traffic through the network to  
4 prevent it from being overloaded. Specifically, the server 13 sets a count  
5 variable D to zero (block 701). When a download request is received  
6 from the home location register (block 702), the count variable D is  
7 incremented by one (block 703) and a timer is set (block 704). Count  
8 variable D is then compared to a reference value M (block 705). If D is  
9 not greater than M, flow exits to block 707 to check to see if a  
10 predetermined period set by the timer has expired. If the timer is not  
11 expired, blocks 702 to 705 are repeated. Otherwise, flow proceeds from  
12 block 707 to block 708 to decrement the count value D by one and  
13 returns to block 702. Thus, the count value D represents the traffic rate  
14 of download requests which may be received from one or more home  
15 location registers. If the count value D is greater than M, the server 13  
16 determines that a traffic congestion has occurred and sends a traffic  
17 congestion message to the home location register 12 (block 706).

18 Home location register 12 operates according to the flowchart of  
19 Fig. 15. In this routine, the home location register monitors the location  
20 registration request traffic from the network 11 and imposes a  
21 restriction control on the traffic of its download requests to the server.  
22 In Fig. 15, the home location register 12 sets a count variable R to zero  
23 (block 801). When a location registration request is received from the  
24 network 11 (block 802), the count variable R is incremented by one  
25 (block 803) and a timer is set (block 804). Count variable R is then

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1 compared to a reference value N (block 805). If R is not greater than N,  
2 flow proceeds from block 805 to block 806 to determine whether a traffic  
3 congestion message is received from the server. If not, flow exits to  
4 block 808 to check for the expiration of the timer. If the timer is still  
5 running, blocks 802 to 806 are repeated. If the timer has expired, the  
6 count value R is decremented by one (block 809) and returns to block  
7 802 to continue the counting process. If R is greater than N or a traffic  
8 congestion message is received from the server, the home location  
9 register proceeds to block 807 to discontinue the transmission of  
10 download requests to the server.

11 In a further modification of the first embodiment of the present  
12 invention, the mobile terminal 10 stores a set of data modules and a set  
13 of version numbers of the data modules. In response to an event  
14 triggered by the user of the mobile terminal, a location registration  
15 request containing the set of version numbers and a phone number of  
16 the mobile terminal. The server 13 stores a set of most recent data  
17 modules and version numbers of the most recent data modules. Home  
18 location register 12 receives a set of version numbers of the most recent  
19 data modules which is transmitted from the server 13 whenever the  
20 network manager 14 makes a change in previous data modules. Home  
21 location register 12 maintains the received set of version numbers in the  
22 memory 35. In response to a location registration request from the  
23 mobile terminal, the home location register 12 compares the version  
24 numbers contained in the received request to the stored version  
25 numbers and requests the server 13 to transmit a copy of the set of most  
26 recent data modules and the version numbers of the most recent data

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1 modules to the client terminal via the communication network if there is  
2 a mismatch between the compared version numbers. The mobile  
3 terminal receives the copy of the most recent data modules and the  
4 version numbers from the server system and updates the installed set of  
5 data modules with the received copy and updates the stored version  
6 numbers with the received version numbers.

7 According to a further modification of the second embodiment of  
8 the present invention, the mobile terminal stores a set of data modules  
9 and transmits a request message to the home location register 12 via the  
10 communication network in response to an event triggered by the user of  
11 the mobile terminal, containing a phone number of the mobile terminal.  
12 The server 13 stores a set of most recent data modules and version  
13 numbers of the most recent data modules. Home location register 12  
14 receives a set of version numbers of the most recent data modules from  
15 the server 13 which is transmitted whenever the network manager 14  
16 makes a change in previous data modules. Home location register 12  
17 stores a set of most recent data modules. Additionally, it stores a  
18 plurality of version numbers of the most recent data modules in the first  
19 memory 35 and maps a plurality of sets of version numbers of data  
20 modules of mobile terminals to a plurality of phone numbers of the  
21 mobile terminals in the second memory 36. Home location register 12,  
22 on receiving a location registration request from the mobile terminal,  
23 compares a set of version numbers mapped in the second memory 36  
24 corresponding to the phone number contained in the received request to  
25 the set of version numbers of the most recent data modules stored in the  
26 first memory 35. If there is a mismatch between the compared version  
27 numbers, the home location register 12 requests the server 13 to

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- 1 transmit a copy of the set of most recent data modules to the mobile
- 2 terminal via the communication network and updates the
- 3 corresponding set of mapped version numbers in the second memory 36
- 4 with the version numbers of the first memory 35. The mobile terminal,
- 5 on receiving the copy of the most recent data modules from the server,
- 6 updates the installed set of data modules with the received copy.
- 7       Such modifications allows efficient updating of a number of data
- 8 modules by sending only one location registration request to the
- 9 network whenever the user triggers an event on the mobile terminal
- 10 such as power-on state, or an operating state of a start-of-call key and
- 11 an end-of-call key, even though the user is not intended to do so.

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What is claimed is:

- 1           1.    A method of updating data installed on a client terminal
- 2    from a server system via a communication network, comprising:
- 3           at said client terminal,
- 4           (a)   storing a version number of the
- 5    installed data;
- 6           (b)   transmitting a request message to the server system via
- 7    the communication network in response to an event triggered by a user
- 8    of said client terminal, said request message containing the version
- 9    number of said data and a phone number of said client terminal,
- 10          at said server system,
- 11          (c)   storing most recent data and a version number of the
- 12    most recent data;
- 13          (d)   receiving the transmitted request and comparing the
- 14    version number contained in the received request to the stored version
- 15    number;
- 16          (e)   transmitting a copy of said most recent data and the
- 17    version number of the most recent data to said client terminal via the
- 18    communication network if there is a mismatch between the compared
- 19    version numbers, and
- 20          at said client terminal,
- 21          (f)   receiving the copy of the most recent data and the
- 22    version number from the server system and updating the installed data
- 23    with the received copy and updating the stored version number with the
- 24    received version number.



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- 1           2.    A method of updating data installed on a client terminal  
2    from a server system via a communication network, comprising:  
3           at said client terminal,  
4           (a)   transmitting a request message to the server system via  
5    the communication network in response to an event triggered by a user  
6    of said client terminal, said request message containing a phone number  
7    of said client terminal,  
8           at said server system,  
9           (b)   storing most recent data and storing a version number  
10   of the most recent data in a first memory and mapping a plurality of  
11   version numbers of said data to a plurality of phone numbers in a  
12   second memory;  
13           (c)   receiving the request transmitted from said client  
14   terminal and comparing a version number mapped in said second  
15   memory corresponding to the phone number contained in the received  
16   request to the version number of the most recent data stored in said first  
17   memory;  
18           (d)   if there is a mismatch between the compared version  
19   numbers, transmitting a copy of said most recent data to said client  
20   terminal via the communication network and updating said  
21   corresponding mapped version number in said second memory with the  
22   version number of the first memory,  
23           at said client terminal,  
24           (e)   receiving the copy of the most recent data from the  
25   server system and updating the installed data with the received copy.

- 1           3.    A method of updating a set of data modules installed on a

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2 client terminal from a server system via a communication network,  
3 comprising:  
4 at said client terminal,  
5 (a) storing a set of version numbers of the installed data  
6 modules;  
7 (b) transmitting a request message to the server system via  
8 the communication network in response to an event triggered by a user  
9 of said client terminal, said request message containing said set of  
10 version numbers and a phone number of the client terminal,  
11 at said server system,  
12 (c) storing a set of most recent data modules and version  
13 numbers of the most recent data modules;  
14 (d) receiving the transmitted request and comparing the  
15 version numbers contained in the received request to the stored version  
16 numbers;  
17 (e) transmitting a copy of the set of most recent data  
18 modules and the version numbers of the most recent data modules to  
19 said client terminal via the communication network if there is a  
20 mismatch between the compared version numbers, and  
21 at said client terminal,  
22 (f) receiving the copy of the most recent data modules and  
23 the version numbers from the server system and updating the installed  
24 set of data modules with the received copy and updating the stored  
25 version numbers with the received version numbers.

1 4. A method of updating a set of data modules installed on a  
2 client terminal from a server system via a communication network,

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3 comprising:

4 at said client terminal,

5 (a) transmitting a request message to the server system via  
6 the communication network in response to an event triggered by a user  
7 of said client terminal, said request message containing a phone number  
8 of said client terminal,

9 at said server system,

10 (b) storing a set of most recent data modules, storing a set of  
11 version numbers of the most recent data modules in a first memory, and  
12 mapping a plurality of sets of version numbers of data modules of  
13 mobile terminals to a plurality of phone numbers of said mobile  
14 terminals in a second memory;

15 (c) receiving the request transmitted from said client  
16 terminal and comparing a set of version numbers mapped in said  
17 second memory corresponding to the phone number contained in the  
18 received request to the set of version numbers of the most recent data  
19 modules stored in said first memory;

20 (d) if there is a mismatch between the compared version  
21 numbers, transmitting a copy of the set of most recent data modules to  
22 said client terminal via the communication network and updating the  
23 corresponding set of mapped version numbers in said second memory  
24 with the version numbers of the first memory,

25 at said client terminal,

26 (e) receiving the copy of the most recent data modules from  
27 the server system and updating the installed set of data modules with  
28 the received copy.

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1           5.    The method of claim 1, 2, 3 or 4, further comprising, at said  
2 server system, imposing traffic control on the transmission of said copy  
3 of most recent data when traffic of the request from said client terminal  
4 exceeds a predetermined rate.

1           6.    The method of claim 1, 2, 3 or 4, wherein said client terminal  
2 is a wireless mobile terminal and said communication network is a  
3 mobile communication network.

1           7.    The method of claim 6, wherein said server system  
2 comprises a home location register connected to said mobile  
3 communication network and a server connected to said home location  
4 register and said network, and wherein said request from the client  
5 terminal is a location registration request.

1           8.    The method of claim 1 or 3, wherein the step (c) further  
2 comprises, at said server system, receiving new data from a network  
3 manager when the network manager makes a change in previous data  
4 and storing the new data as said most recent data.

1           9.    The method of claim 2 or 4, wherein the step (b) further  
2 comprises, at said server system, receiving new data from a network  
3 manager when the network manager makes a change in previous data  
4 and storing the new data as said most recent data.

1           10.   A method of updating data installed on a client terminal,  
2 comprising:

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3 at said client terminal,  
4 (a) storing a version number of the installed data; and  
5 (b) transmitting a request message to a receiving server via  
6 a communication network in response to an event triggered by a user of  
7 said client terminal, said request message containing the version  
8 number of said data and a phone number of the client terminal,  
9 at said receiving server,  
10 (c) storing a version number of most recent data;  
11 (d) receiving the request from the client terminal via the  
12 communication network and comparing the version number contained  
13 in the received request to the stored version number; and  
14 (e) transmitting a download request to a sending server if  
15 there is a mismatch between the compared version numbers,  
16 at said sending server,  
17 (f) storing said most recent data and transmitting a copy of  
18 said most recent data and the version number of the most recent data to  
19 said client terminal via the communication network in response to said  
20 download request from the receiving server, and  
21 at said client terminal,  
22 (g) receiving the copy of the most recent data and the  
23 version number from the sending server and updating the installed data  
24 with the received copy and updating the stored version number with the  
25 received version number.

1 11. A method of updating data installed on a client terminal,  
2 comprising:  
3 at said client terminal,

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4 (a) transmitting a request message to a receiving server via  
5 a communication network in response to an event triggered by a user of  
6 said client terminal, said request message containing a phone number of  
7 said client terminal.

8 at said receiving server.

9 (b) storing a version number of most recent data in a first  
10 memory and mapping a plurality of version numbers of said data to a  
11 plurality of phone numbers in a second memory;

12 (c) receiving the request from said client terminal via the  
13 communication network and comparing a version number mapped in  
14 said third memory corresponding to the phone number contained in the  
15 received request to the version number of the most recent data stored in  
16 said second memory; and

(d) if there is a mismatch between the compared version numbers, transmitting a download request message to a sending server and updating said corresponding mapped version number in said second memory with the version number of the first memory,

21 at said sending server,

22 (e) storing said most recent data and transmitting a copy of  
23 said most recent data to said client terminal via the communication  
24 network, and

25 at said client terminal.

(f) receiving the copy of the most recent data from the  
sending server and updating the installed data with the received copy.

1 12. The method of claim 10 or 11, further comprising, at said  
2 receiving server, imposing traffic control on said download request

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- 3 when traffic of the request from said client terminal exceeds a  
4 predetermined rate.

1 13. The method of claim 10 or 11, further comprising, at said  
2 sending server, imposing traffic control on the transmission of said copy  
3 of most recent data when traffic of the download request from said  
4 receiving server exceeds a predetermined rate.

1 14. The method of claim 10 or 11, wherein said client terminal is  
2 a wireless mobile terminal and said communication network is a mobile  
3 communication network, and wherein said receiving server is a home  
4 location register connected to said network and said sending server, and  
5 wherein said request from the client terminal is a location registration  
6 request.

1 15. The method of claim 10, wherein the step (f) further  
2 comprises, at said sending server, receiving new data from a network  
3 manager when the network manager makes a change in previous data  
4 and storing the new data as said most recent data.

1 16. The method of claim 11, wherein the step (e) further  
2 comprises, at said sending server, receiving new data from a network  
3 manager when the network manager makes a change in previous data  
4 and storing the new data as said most recent data.

1 17. A client-server system comprising:  
2 a client terminal for storing a version number of data installed on

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3 the client terminal and transmitting a request message to a  
4 communication network in response to an event triggered by a user of  
5 said client terminal, said request message containing the version  
6 number of said data and a phone number of said client terminal; and  
7 a server system for storing most recent data and a version  
8 number of the most recent data, receiving said request from the client  
9 terminal via said communication network and comparing the version  
10 number contained in the received request to the stored version number,  
11 and transmitting a copy of said most recent data and the version  
12 number of the most recent data to said client terminal via the  
13 communication network if there is a mismatch between the compared  
14 version numbers,  
15 said client terminal receiving the copy of the most recent data  
16 and the version number from the server system and updating the  
17 installed data with the received copy and updating the stored version  
18 number with the received version number.

1 18. A client-server system comprising:  
2 a client terminal for transmitting a request message to a  
3 communication network in response to an event triggered by a user of  
4 said client terminal, said request message containing a phone number of  
5 said client terminal,  
6 a server system for storing most recent data and a version  
7 number of the most recent data in a first memory and mapping a  
8 plurality of version numbers of said data to a plurality of phone  
9 numbers in a second memory, receiving said request from said client  
10 terminal via said communication network, comparing a version number



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11 mapped in said second memory corresponding to the phone number  
12 contained in the received request to the version number of the most  
13 recent data stored in said first memory, and transmitting a copy of said  
14 most recent data to said client terminal via the communication network  
15 and updating said corresponding mapped version number in said  
16 second memory with the version number of the first memory if there is a  
17 mismatch between the compared version numbers,  
18       said client terminal receiving the copy of the most recent data  
19 from the server system and updating the installed data with the  
20 received copy.

1       19. A client-server system comprising:  
2       a client terminal for storing a set of version numbers of data  
3 modules installed on the client terminal, transmitting a request message  
4 to a communication network in response to an event triggered by a user  
5 of said client terminal, said request message containing said set of  
6 version numbers and a phone number of the client terminal;  
7       a server system for storing a set of most recent data modules and  
8 version numbers of the most recent data modules, receiving the request  
9 from the client terminal via said communication network, comparing  
10 the version numbers contained in the received request to the stored  
11 version numbers, and transmitting a copy of the set of most recent data  
12 modules and the version numbers of the most recent data modules to  
13 said client terminal via the communication network if there is a  
14 mismatch between the compared version numbers;  
15       said client terminal receiving the copy of the most recent data  
16 modules and the version numbers from the server system and updating

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17 data modules installed on the client terminal with the received copy and  
18 updating the stored version numbers with the received version  
19 numbers.

1           20. A client-server system comprising:  
2           a client terminal for transmitting a request message to a  
3 communication network in response to an event triggered by a user of  
4 said client terminal, said request message containing a phone number of  
5 said client terminal; and  
6           a server system for storing a set of most recent data modules,  
7 storing a set of version numbers of the most recent data modules in a  
8 first memory, mapping a plurality of sets of version numbers of data  
9 modules of mobile terminals to a plurality of phone numbers of said  
10 mobile terminals in a second memory, receiving the request transmitted  
11 from said client terminal and comparing a set of version numbers  
12 mapped in said second memory corresponding to the phone number  
13 contained in the received request to the set of version numbers of the  
14 most recent data modules stored in said first memory, and transmitting  
15 a copy of the set of most recent data modules to said client terminal via  
16 the communication network and updating the corresponding set of  
17 mapped version numbers in said second memory with the version  
18 numbers of the first memory if there is a mismatch between the  
19 compared version numbers,  
20           said client terminal receiving the copy of the most recent data  
21 modules from the server system and updating data modules installed on  
22 the client terminal with the received copy.

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1           21. The system of claim 17, 18, 19 or 20, wherein said server  
2 system is configured to impose traffic control on the transmission of said  
3 copy of most recent data when traffic of the request from said client  
4 terminal exceeds a predetermined rate.

1           22. The system of claim 17, 18, 19 or 20, wherein said client  
2 terminal is a wireless mobile terminal and said communication network  
3 is a mobile communication network.

1           23. The system of claim 22, wherein said server system  
2 comprises a home location register connected to said mobile  
3 communication network and a server connected to said home location  
4 register and said network, and wherein said request from the client  
5 terminal is a location registration request.

1           24. The method of claim 17, 18, 19 or 20, wherein said server  
2 system is configured to receive new data from a network manager when  
3 the network manager makes a change in previous data and storing the  
4 new data as said most recent data.

1           25. A client-server system comprising:  
2 a client terminal for storing a version number of data installed on  
3 the client terminal, and transmitting a request message to a  
4 communication network in response to an event triggered by a user of  
5 said client terminal, said request message containing the version  
6 number of said data and a phone number of the client terminal; and  
7 a receiving server for storing a version number of most recent

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8 data, receiving the request from the client terminal via the  
9 communication network, comparing the version number contained in  
10 the received request to the stored version number, and transmitting a  
11 download request to a sending server if there is a mismatch between the  
12 compared version numbers,  
13 said sending server storing said most recent data and  
14 transmitting a copy of said most recent data and the version number of  
15 the most recent data to said client terminal via the communication  
16 network in response to said download request from the receiving server,  
17 said client terminal receiving the copy of the most recent data  
18 and the version number from the sending server and updating the  
19 installed data with the received copy and updating the stored version  
20 number with the received version number.

1 26. A client-server system comprising:  
2 a client terminal for transmitting a request message to a  
3 communication network in response to an event triggered by a user of  
4 said client terminal, said request message containing a phone number of  
5 said client terminal;  
6 a receiving server for storing a version number of most recent  
7 data in a first memory and mapping a plurality of version numbers of  
8 said data to a plurality of phone numbers in a second memory, receiving  
9 the request from said client terminal via the communication network  
10 and comparing a version number mapped in said third memory  
11 corresponding to the phone number contained in the received request to  
12 the version number of the most recent data stored in said second  
13 memory, and transmitting a download request message to a sending

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14 server and updating said corresponding mapped version number in said  
15 second memory with the version number of the first memory if there is  
16 a mismatch between the compared version numbers,  
17 said sending server storing said most recent data and  
18 transmitting a copy of said most recent data to said client terminal via  
19 the communication network,  
20 said client terminal receiving the copy of the most recent data  
21 from the sending server and updating the installed data with the  
22 received copy.

1 27. The system of claim 25 or 26, wherein said receiving server  
2 is configured to impose traffic control on said download request when  
3 traffic of the request from said client terminal exceeds a predetermined  
4 rate.

1 28. The system of claim 25 or 26, wherein said sending server is  
2 configured to impose traffic control on the transmission of said copy of  
3 most recent data when traffic of the download request from said  
4 receiving server exceeds a predetermined rate.

1 29. The system of claim 25 or 26, wherein said client terminal is  
2 a wireless mobile terminal and said communication network is a mobile  
3 communication network, and wherein said receiving server is a home  
4 location register connected to said network and said sending server, and  
5 wherein said request from the client terminal is a location registration  
6 request.

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- 1           30. The system of claim 25 or 26, wherein said sending server is
- 2   configured to receive new data from a network manager when the
- 3   network manager makes a change in previous data and store the new
- 4   data as said most recent data.

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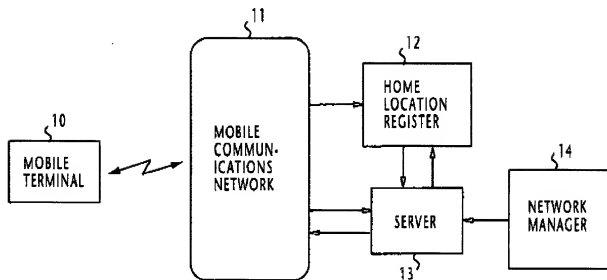
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ABSTRACT OF THE DISCLOSURE

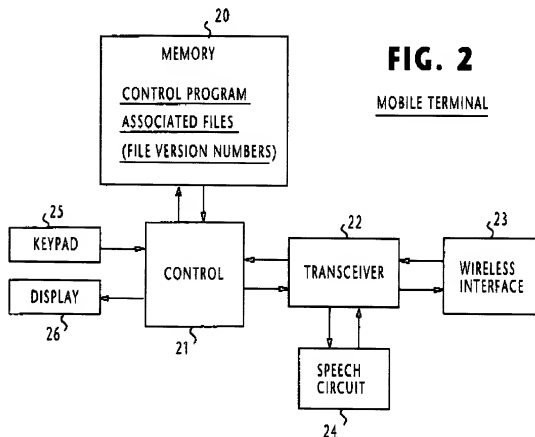
1        A client terminal, such as mobile terminal, stores a version  
2 number of its installed data or control program and transmits a request  
3 message to the server system via a communication network in response  
4 to an event triggered by a user of the client terminal, the request  
5 message containing the version number of the data and a phone number  
6 of the client terminal. The server system stores most recent data and a  
7 version number of the most recent data. When the server system  
8 receives the transmitted request, it compares the version number  
9 contained in the received request to the stored version number and  
10 transmits a copy of the most recent data and the version number of the  
11 most recent data to the client terminal via the communication network  
12 if there is a mismatch between the compared version numbers. The  
13 client terminal receives the copy of the most recent data and the  
14 version number from the server system and updates the installed data  
15 with the received copy and updates the stored version number with the  
16 received version number.

**FIG. 1**



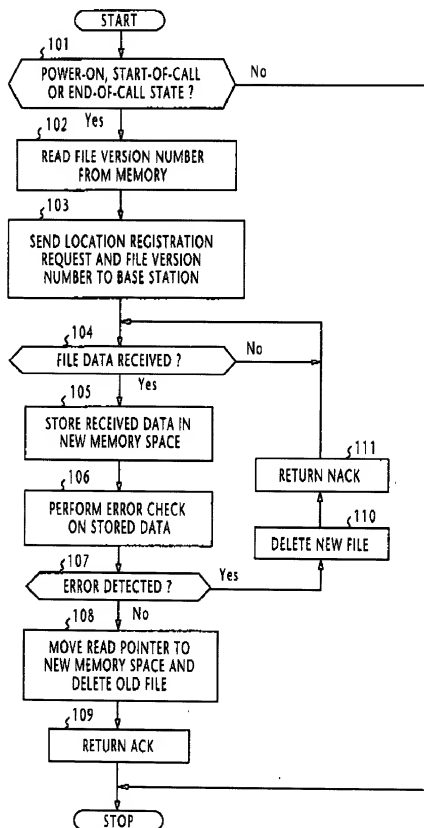
**FIG. 2**

MOBILE TERMINAL



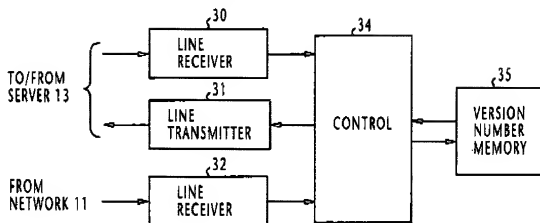


**FIG. 3**  
**MOBILE TERMINAL**



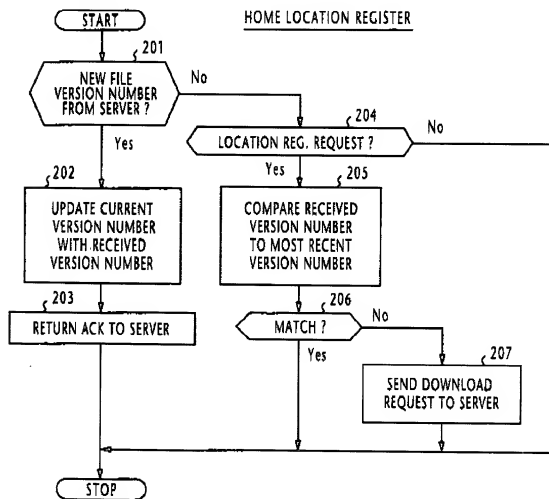
**FIG. 4**

HOME LOCATION REGISTER



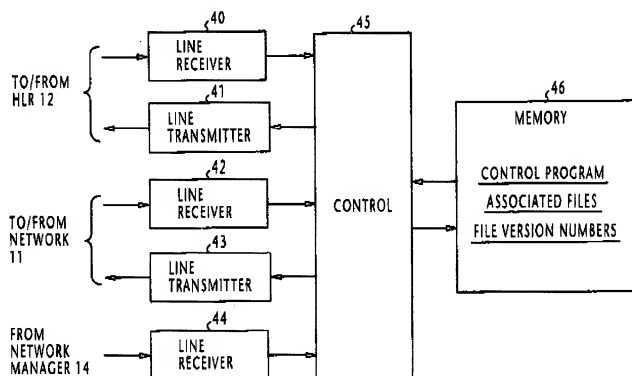
**FIG. 5**

HOME LOCATION REGISTER

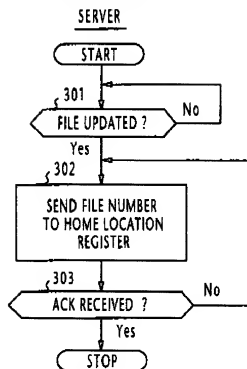


**FIG. 6**

SERVER



**FIG. 7A**



**FIG. 7B**

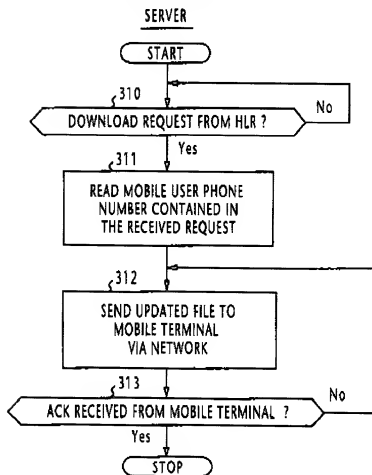
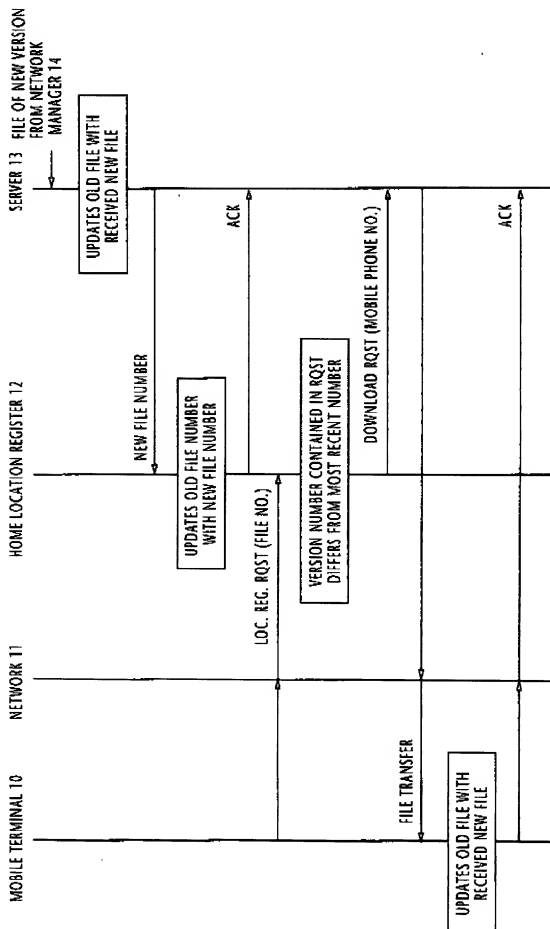
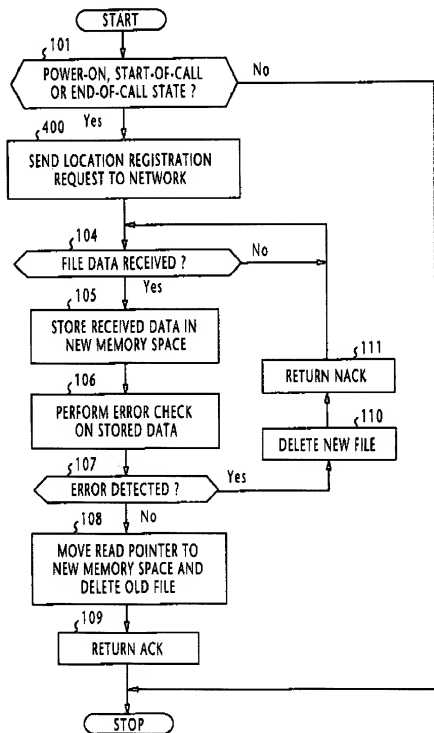
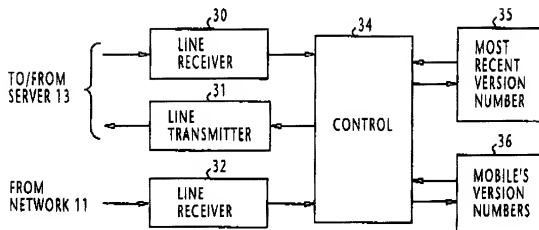
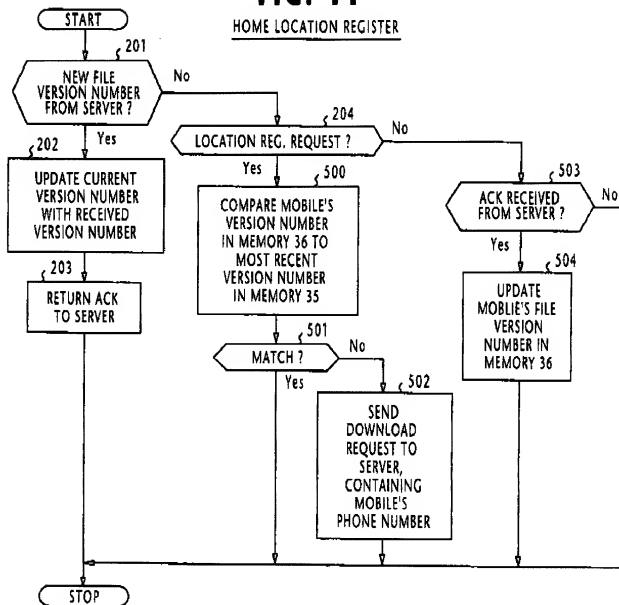


FIG. 8



**FIG. 9**  
**MOBILE TERMINAL**



**FIG. 10**HOME LOCATION REGISTER**FIG. 11**HOME LOCATION REGISTER

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**FIG. 12**

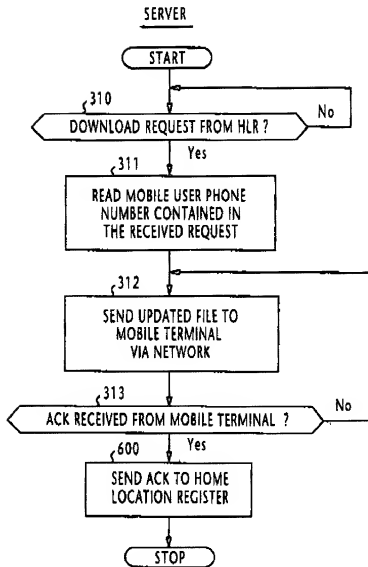
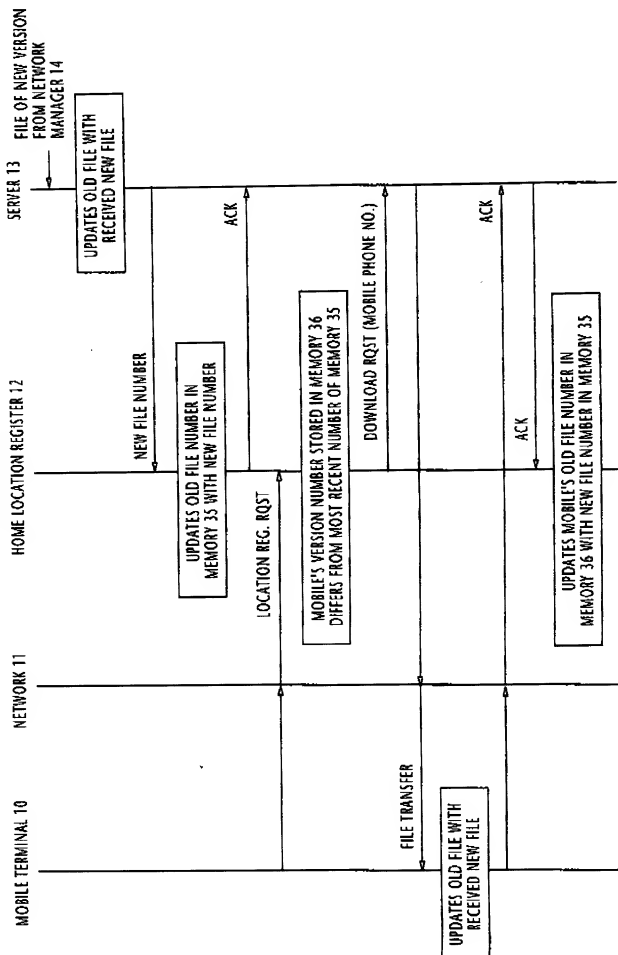


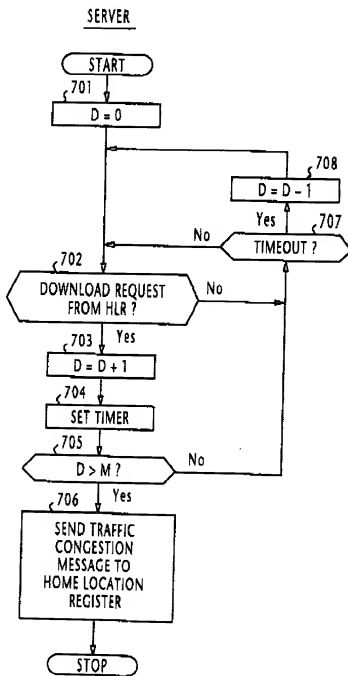


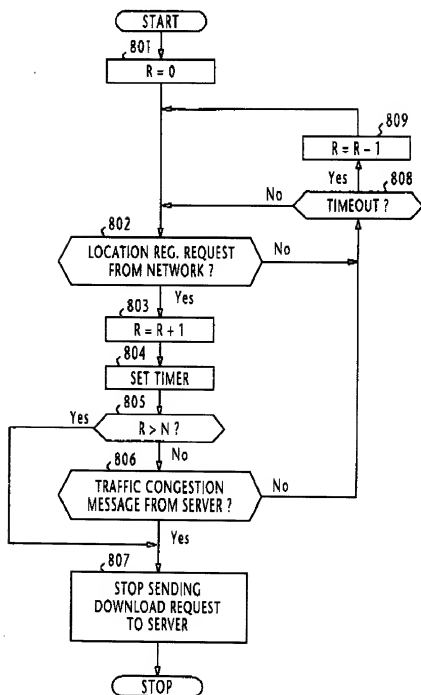
FIG. 13



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NE-1024

**FIG. 14**

**FIG. 15**HOME LOCATION REGISTER

**COMBINED DECLARATION AND POWER OF ATTORNEY**

As a below named inventor, I hereby declare that

My residence, post office address and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

**METHOD OF UPDATING CLIENT'S INSTALLED DATA IN RESPONSE TO  
A USER-TRIGGERED EVENT**

the specification of which: (check one)

**REGULAR OR DESIGN APPLICATION**

- ☒ is attached hereto.
- ☐ was filed on \_\_\_\_\_ as application Serial No. \_\_\_\_\_ and was amended on \_\_\_\_\_ (if applicable).

**PCT FILED APPLICATION ENTERING NATIONAL STAGE**

- ☐ was described and claimed in International application No. \_\_\_\_\_ filed on \_\_\_\_\_ and as amended on \_\_\_\_\_ (if any).

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, §1.56.

**PRIORITY CLAIM**

I hereby claim foreign priority benefits under 35 USC 119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed.

**PRIOR FOREIGN APPLICATION(S)**

Country	Application Number	Date of Filing (day, month, year)	Priority Claimed
Japan	11-255390	09,09,1999	Yes

(Complete this part only if this is a continuing application.)

I hereby claim the benefit under 35 USC 120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of 35 USC 112, I acknowledge the duty to disclose information which is material to patentability as defined in Title 37 Code of Federal Regulations §1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application:

(Application Serial No.)

(Filing Date)

(Status--patented, pending, abandoned)

## POWER OF ATTORNEY


The undersigned hereby authorizes the U.S. attorney or agent named herein to accept and follow instructions from \_\_\_\_\_ as to any action to be taken in the Patent and Trademark Office regarding this application without direct communication between the U.S. attorney or agent and the undersigned. In the event of a change in the persons from whom instructions may be taken, the U.S. attorney or agent named herein will be so notified by the undersigned.

As a named inventor, I hereby appoint the following attorney(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith: **Robert J. PATCH, Reg. No. 17,355, Andrew J. PATCH, Reg. No. 32,925, Robert F. HARGEST, Reg. No. 25,590, Benoit CASTEL, Reg. No. 35,041, Eric JENSEN, Reg. No. 37,855, and Thomas W. PERKINS, Reg. No. 33,027, c/o YOUNG & THOMPSON, Second Floor, 745 South 23rd Street, Arlington, Virginia 22202.**

Address all telephone calls to Young & Thompson at 703/521-2297.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Full name of sole or first inventor: **Tetsuji ADACHI**  
(given name, family name)

Inventor's signature Tetsuji Adachi  Date September 5, 2000

Residence: Tokyo, Japan Citizenship: Japanese

Post Office Address: c/o NEC Corporation, 7-1, Shiba 5-chome, Minato-ku, Tokyo, Japan

Full name of second joint inventor, if any:  
(given name, family name)

Inventor's signature \_\_\_\_\_ Date \_\_\_\_\_

Residence: \_\_\_\_\_ Citizenship: \_\_\_\_\_

Post Office Address: \_\_\_\_\_

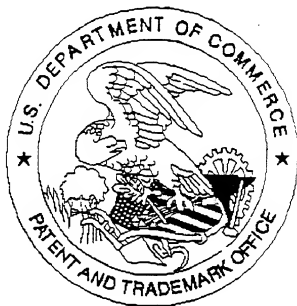
Full name of third joint inventor, if any:  
(given name, family name)

Inventor's signature \_\_\_\_\_ Date \_\_\_\_\_

Residence: \_\_\_\_\_ Citizenship: \_\_\_\_\_

Post Office Address: \_\_\_\_\_

United States Patent & Trademark Office  
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*There are 34 pages of Specification*

☐ Scanned copy is best available.